Features

- Transient protection for high-speed data lines
  IEC61000-4-2 (ESD) ±20kV (Air)
  ±20kV (Contact)
  IEC61000-4-5 (Lightning) 13.0A (8/20μs)
- Small package saves board space
- Protects one I/O line (bidirectional)
- Low capacitance: 0.9pF@0V (Typical) (I/O-I/O)
- Low leakage current: 0.01μA@V_{RWM} (Maximum)
- Low clamping voltage
- Each I/O pin can withstand over 1000 ESD strikes for ±20kV contact discharge

Applications

- Computers and peripherals
- ESD and surge protection for interface lines:
  - USB 2.0
  - HDMI 1.3/1.4

Mechanical Characteristics

- Package: DFN1006-2L
- Marking: Part number
- Packaging: Tape and Reel
- ROHS compliant

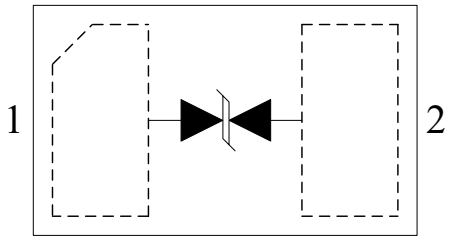
Description

TS0301TBX is an ultra-low capacitance Transient Voltage Suppressor (TVS) designed to provide electrostatic discharge (ESD) protection for high-speed data interfaces. With typical capacitance of 0.9pF only, it is designed to protect parasitic-sensitive systems against over-voltage and over-current transient events. It complies with IEC61000-4-2 (ESD), Level 4 (±8kV contact, ±15kV air discharge).

The TS0301TBX comes in a RoHS compliant and Halogen Free 1.0mm x 0.6mm x 0.55mm DFN1006-2L package.

Circuit Diagram

Pin Configuration

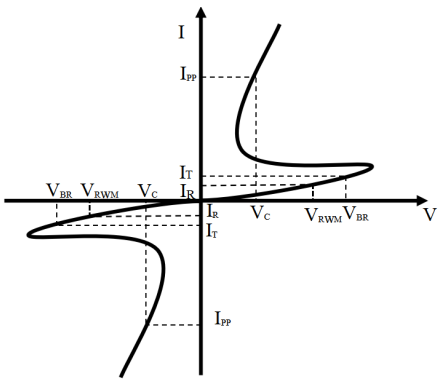


DFN1006-2L
(Top View)

Absolute Maximum Rating

Symbol	Parameter	Value	Units
I_{PP}	Peak Pulse Current (8/20μs)	13	A
P_{PK}	Peak Pulse Power (8/20μs)	104	W
V_{ESD}	ESD per IEC61000-4-2 (Air) ESD per IEC61000-4-2 (Contact)	±20 ±20	kV
T_{OPT}	Operating Temperature	-55/+125	°C
T_{STG}	Storage Temperature	-55/+150	°C

Electrical Characteristics (T = 25°C)

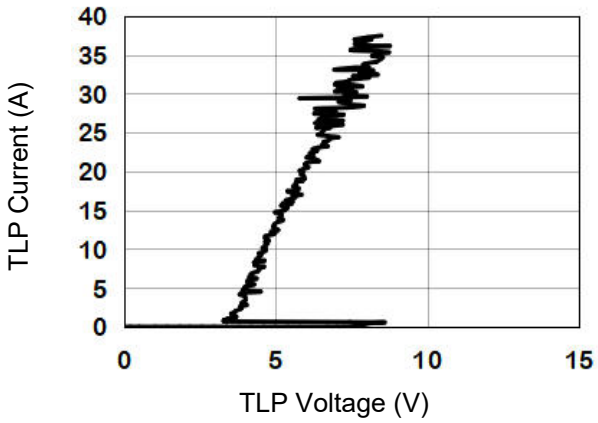
Symbol	Parameter	Diagram
V_{RWM}	Nominal Reverse Working Voltage	
I_R	Reverse Leakage Current @ V_{RWM}	
V_{BR}	Reverse Breakdown Voltage @ I_T	
I_T	Test Current for Reverse Breakdown	
V_C	Clamping Voltage @ I_{PP}	
I_{PP}	Maximum Peak Pulse Current	
C_{ESD}	Parasitic Capacitance	
R_{dyn}	Dynamic Resistance	

Symbol	Test Condition	Minimum	Typical	Maximum	Units
V_{RWM}				3.3	V
I_R	V_{RWM} = 3.3V, T = 25°C		1	10	nA
V_{BR}	I_T = 1mA	6.0	8.0		V
V_C	I_{PP} = 13A, t_p = 8/20μs		5.5	8.0	V
V_C	I_{PP} = 8.0A, t_p=100ns(1)		4.3		V
	I_{PP} = 16.0A, t_p=100ns(1)		5.6		V
R_{dyn}	I_{PP} = 12.0A, t_p = 100ns(1)		0.16		Ω
C_{ESD}	V_R = 0V, f = 1MHz		0.9		pF

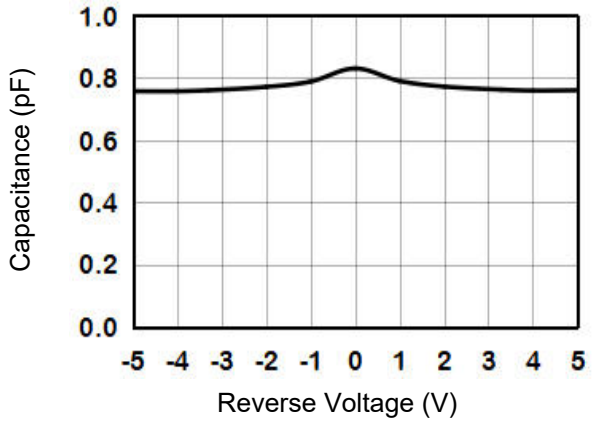
Notes:(1)Measurements performed using a 100ns Transmission Line Pulse(TLP) system.

Typical Performance Characteristics

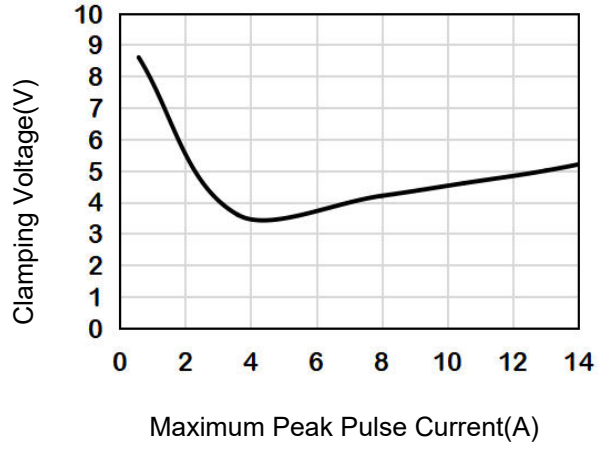
TLP Measurement of I/O to I/O



Capacitance vs Reverse Voltage IO to IO

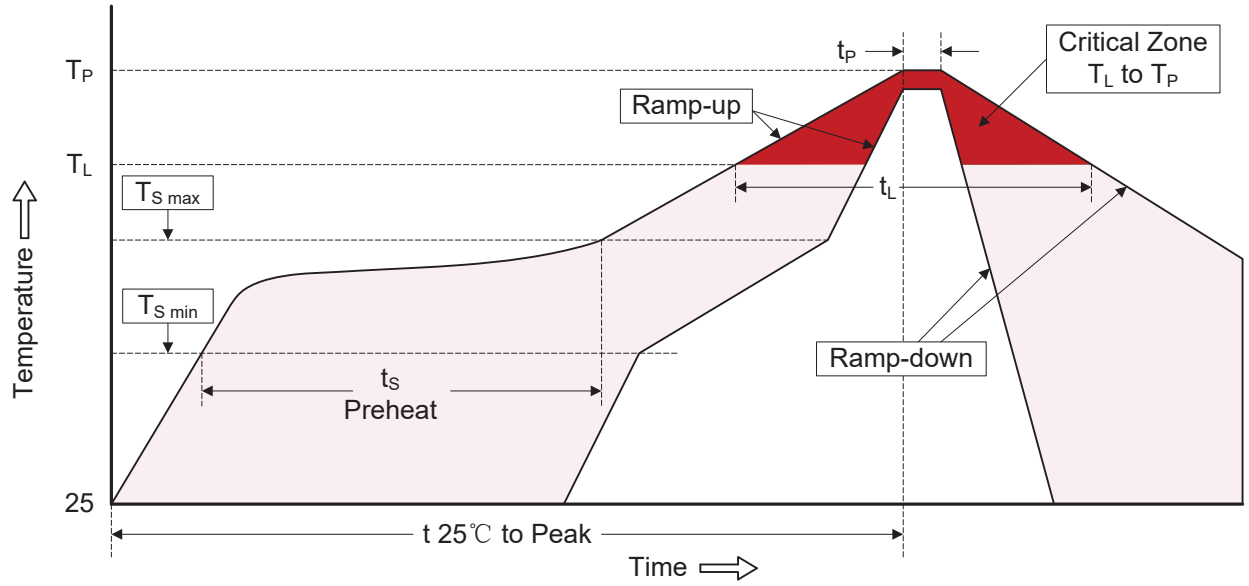


8/20us Current IO to IO



Recommended Soldering Conditions

Reflow Soldering

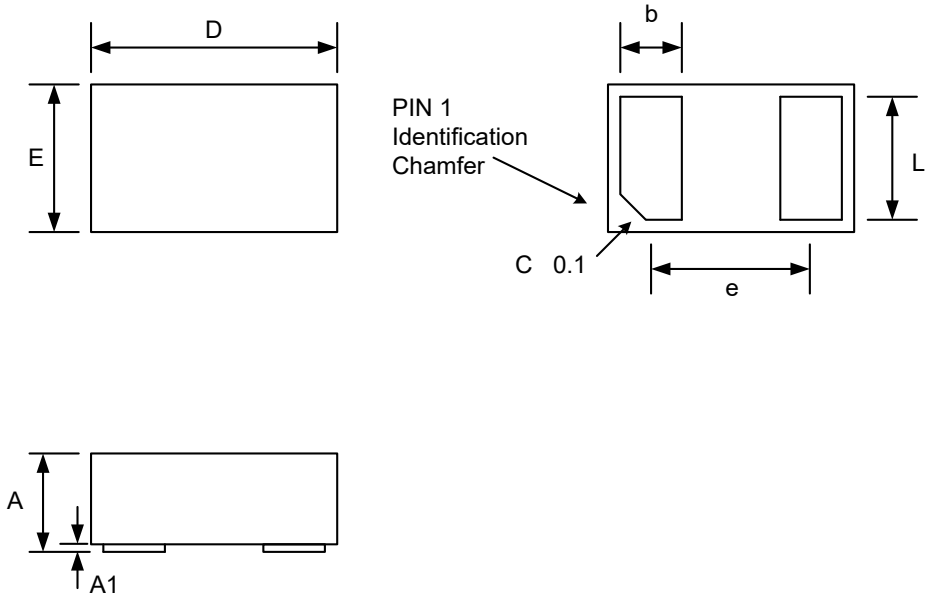


Recommended Conditions

Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	3℃/second max.
Preheat -Temperature Min ($T_{S\ min}$) -Temperature Max ($T_{S\ max}$) -Time (min to max) (ts)	 150℃ 200℃ 60-180 seconds
$T_{S\ max}$ to T_L -Ramp-up Rate	 3℃/second max.
Time maintained above: -Temperature (T_L) -Time (t_L)	 217℃ 60-150 seconds
Peak Temperature (T_P)	260℃
Time within 5℃ of actual Peak Temperature (t_P)	20-40 seconds
Ramp-down Rate	6℃/second max.
Time 25℃ to Peak Temperature	8 minutes max.

Package Outline

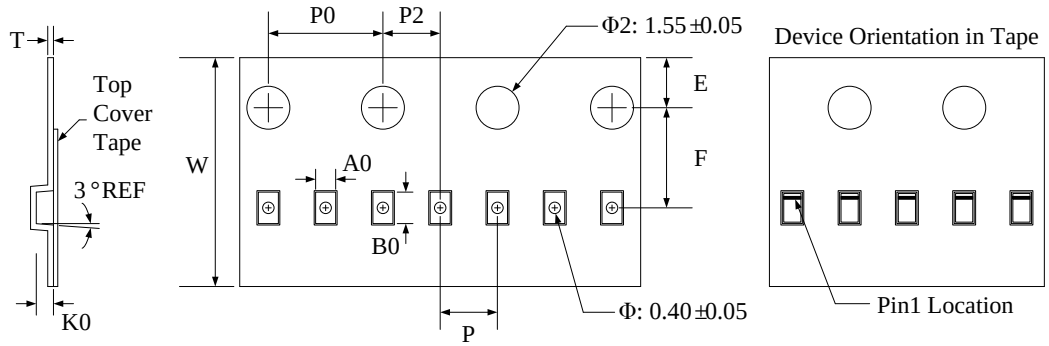
- ❑ DFN1006-2L package
- ❑ 2 leads, very small package
- ❑ MSL-1



Package Dimensions (Controlling dimensions are in millimeters)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Minimum	Maximum	Minimum	Maximum
A	0.400	0.500	0.016	0.020
A1	0.000	0.050	0.000	0.002
D	0.950	1.050	0.037	0.041
E	0.550	0.650	0.022	0.026
b	0.200	0.300	0.008	0.012
e	0.650 BSC		0.026 BSC	
L	0.450	0.550	0.018	0.022

Tape and Reel Specification



Symbol	W	A0	B0	K0	E	F	P	P0	P2	T
Dimensions (mm)	8.00±0.1	0.7±0.05	1.15±0.05	0.55±0.05	1.75±0.1	3.5±0.05	2.0±0.1	4.0±0.1	2.0±0.05	0.2±0.05

Marking Codes

XT

Note:
(1) "T" is part number.
(2) "X" is the internal code.

Ordering Information

Part Number	Working Voltage	Quantity Per Reel	Reel Size
TS0301TBX	3.3V	10,000	7 Inch